Using the Flutter Database

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Using the Flutter Database The Flutter Database is a compilation of data for a number of different tape decks. I hope that you will contribute additional data (Scully, MCI, Ampex 300, etc.) so that we can make the list more comprehensive. Each rotating component on a tape deck has a flutter signature consisting of flutter components at the rotational rate of the component. Since the flutter created by the component is not necessarily a pure sinewave, we will also potentially have components at the harmonics of the basic rotational rate. In addition, components that are mounted on ball bearings will have additional components contributed by the rotation of the balls and their retainer within the bearing. Here we have four possibilities:

1. A ding in the outer race of the bearing, 2. A ding in the inner race of the bearing, 3. A ding in the surface of the ball, 4. An imperfection in the retainer cage that separates the balls. We must know the size of the balls and bearing races to calculate these individual rates. Motors have additional flutter components related to their torque pulsations. An AC motor will have torque pulsations at twice the AC mains frequency, at the once around rate of the motor, and at harmonics of the once around rate due to the multiple poles within the motor (ranging from two to as many as 12 poles.) DC motors have additional torque pulsations each time a new commutator segment moves into contact with a brush. The spreadsheet begins with a graph showing how the rotation rates of the supply and takeup reels change throughout the reel. The flutter rates due to spooling motors, spindles, and motor bearings will vary accordingly throughout the tape pack. Next comes the data for individual machines, arranged by machine brand and model. The first entry should be the manufacturer s quoted flutter specifications for the machine. The second entry is a measure of the distance from the record head gap to the playback head gap, representing the delay experienced during simultaneous record/playback operation. This distance is inverted and combined with the tape speed to derive an equivalent rate of a roller with a circumference equal to this head spacing. If we had a roller of this size in the tape path, we could not measure its flutter. The roller s eccentricity would produce a speed disturbance as the tape passes over the record head gap, but it will create an identical disturbance exactly one rotation later as the tape passes over the playback head gap. The flutter meter will therefore see no relative error. On the other hand, the roller s circumference might be twice the distance between the heads. In this case, the eccentricity will produce opposite speed errors at the two heads, causing twice the error to be read by the flutter meter. We account for the range of possible interactions ONLY DURING SIMULTANEOUS RECORD/PLAYBACK OPERATION with the R/P constant in column L. A value of zero represents cancellation as described in the first case above; a value of 2 represents the doubling as in the second case above. If the value is near 1, then we can properly measure this component in simultaneous record/play. This R/P factor is also important for decks that have rollers in constant, non-slipping contact with the tape, such as tape timer rollers or capstans without pinchrollers (ATR-100, MTR-90, etc.) These components will probably not change their relationship to the recorded flutter signal on the tape when we rewind the tape and measure flutter in playback mode. Depending upon the R/P factor,

we may need to manually re-orient these components with respect to the tape each time we start a new flutter playback run. Each rotating component has entries for each of the tape speeds. Components with ball bearings have additional entries for the bearing rates. (Sleeve bearings or bushings such as the upper bearing on an Ampex direct drive hysteresis synchronous capstan motor do not have rotational rates, but the shaft can actually rattle around inside a worn sleeve bearing.) The biggest omission is that no transport resonances are tabulated. These are very important contributors to the flutter performance. I hope you find this database to be useful, and I also hope that you will help me acquire additional data on these and other machines to extend the scope of this document. I hope that we will also be able to add typical values for each of the machines, and possibly even each of the individual components. Good luck with your measurements. An additional document, Flutter Measurement the Book.doc describes flutter measurement techniques. This document is currently still only a draft of the final version, but it is very usable.